

## COMPOSITE INSOLE FOR FOOTWEAR AND MANUFACTURING METHOD

Field of the invention

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This invention generally finds application in the field of footwear and particularly relates to a composite insole as defined in the preamble of claim 1, and to a method of manufacturing same.

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Prior art

The heel is known to be the portion of the foot that is most subjected to shocks and impulsive stresses during 15 walking. For this reason, in many footwear and insole products shock absorbing members are provided at the heel region.

Particularly, EP-A-1166671, WO-A-0024283, WO-A-9831249, 20 US-A-2002092203, US-A-5718063 disclose insoles having a polymeric base material and at least one cavity or opening in which one or more gel inserts are received. Generally, at least one gel insert is placed in a rear portion of the insole at the user's heel to absorb 25 shocks from the ground.

A drawback of such arrangements is that the insert has a small size and causes an uneven distribution of mechanical properties in the rear portion and the 30 insole, thereby affecting comfort for the user. Particularly, transition portions having different stiffness properties are provided between the base material and the gel material. These transition

portions may be felt by the wearer and may be particularly uncomfortable as they are placed in the rear portion of the insole, which is subjected to frequent and relatively high stresses.

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US-A-2002166259 and FR-A-2808427 disclose respective insoles having a layer of gel material with an upper surface extending substantially all over the plant of the user's foot. A cover layer is further provided, for 10 wholly covering at least the upper surface of the gel layer, in such a manner as to prevent direct contact therewith.

A disadvantage of such arrangements lies in that the 15 cover layer may limit the shock absorbing capacity of the gel layer, thereby affecting the comfort level during walking. Additionally, the arrangement disclosed in US-A-2002166259 provides local portions having different stiffnesses, which can cause inconvenient 20 discontinuities of the pressure felt by the foot and affect the overall comfort.

EP-A-0774219 discloses a footwear insole having a base body made of polymeric foam and a cushion filled with 25 gel positioned on the upper surface of the insole to interact with the user's foot. The insole further has a cavity at the heel portion, which is designed to receive a member for absorption of impulsive stresses on the heel.

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A disadvantage of this arrangement consists in that the interaction between the gel cushion and the base body and the interaction between the gel contained in the

cushion and the walls thereof may affect the shock absorption and deformation capacities of the gel, thereby reducing the stress absorption effect.

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### Summary of the invention

A primary object of this invention is to obviate the above drawbacks, by providing a composite footwear insole having high comfort properties.

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A particular object is to provide an insole which can uniformly distribute stress over the foot and particularly over areas subjected to higher pressure, such as the heel and the metatarsal regions.

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A further object of the invention is to provide an insole which has a continuous surface in contact with the foot at the areas subjected to greater stress, which has no discontinuity in stiffness or other 20 mechanical properties.

Yet another particular object is to provide an insole which allows transpiration at the foot areas that are more prone to sweating.

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These objects, as well as other objects that will be more apparent hereafter, are fulfilled, according to claim 1, by a composite footwear insole having a front portion for interacting with the foot at the metatarsal 30 region and at least partly at the plantar arch, and a rear portion for interacting with the heel, characterized in that the rear portion has at least one top layer of gel material whose plan size is at least

substantially equal to that of the rear portion to uniformly support the heel and absorb stresses acting thereon.

- 5 Thanks to this particular arrangement, a particularly comfortable insole may be provided, which can uniformly distribute stresses on the foot and particularly on the heel.

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#### Brief description of the drawings

- Further characteristics and advantages of the invention will be more apparent from the detailed description of a few preferred, non-exclusive embodiments of an insole  
15 according to the invention, which are described as a non-limiting example with the help of the annexed drawings, in which:

- FIG. 1 is a perspective view of a first insole according to the invention;
- 20 FIG. 2 is a perspective view of a second insole according to the invention;
- FIG. 3 is a perspective view of a third insole according to the invention;
- FIG. 4 is a perspective view of a fourth insole  
25 according to the invention;

#### Detailed description of a preferred embodiment

- Particularly referring to the above figures, a  
30 composite insole according to the invention, designed for various footwear types, and generally designated by numeral 1, will be described.

The insole 1 has a front portion 2 for interacting with the foot at the metatarsal region and at least partly at the plantar arch, and a rear portion 3 for interacting with the heel.

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A peculiar feature of the invention is that the rear portion 3 has a gel layer 4 whose plan size is substantially equal to that of the rear portion 3 itself. Thus, the heel may be evenly supported and 10 stresses thereon may be effectively absorbed.

The gel layer 4 may have an upper surface 5 for interacting with the heel, which is substantially continuous, with no surface discontinuity, to further 15 increase comfort. Furthermore, the gel layer 4 may be made either of one piece, from one gel material, or of multiple superimposed layers of different gel materials. For example, two gel materials having different stiffnesses and/or densities may be used. Gel materials 20 may be of various kinds, and preferably of the polyurethane type.

In certain embodiments, the rear portion 3 may be wholly made of gel material, as shown in FIG. 1 and FIG. 25. In this case, the gel layer 4 extends through the whole thickness of the rear portion 3, which may be connected to the front portion 2 by a continuous junction 6.

30 In other embodiments, as shown in FIG. 2 and FIG. 4, the rear portion 3 may comprise a support base 7 made of a semi-rigid, natural or synthetic material, such as a polymeric foam, which lies under the gel layer 4.

Here, the support base 7 may only extend across the rear portion 3 or also across the front portion 2.

Both in case that the gel layer 4 extends through the 5 whole thickness of the rear portion 3, and when a support base 7 is provided under the gel layer 4, the latter may be joined to the front portion 2 by a substantially continuous connecting portion 8, thereby providing a transition between the upper surface 5 of 10 the rear portion 3 and the upper surface 9 of the front portion 2, which is substantially free of discontinuities and inconvenient steps.

The gel layer 4 may be finished at least on the upper 15 surface 5 with a varnish which is capable of reducing tackiness between the rear portion 3 and the heel, to prevent the unpleasant sensation of partial tackiness between the heel and the upper surface 5.

20 Suitably, the gel layer 4 may have a raised peripheral edge (not shown in the drawings) to substantially conform to the heel anatomy and promote retention thereof during walking. Also, the rear portion 3 may have a one-piece appendix (not shown) which extends 25 toward the plantar arch of the foot. Both this one-piece appendix and the raised edge are well-known arrangements to improve the anatomic fit of the insole 1 as well as comfort for the user.

30 The front portion 2 may comprise at least one layer of transpiring material (not shown in the drawings), which may be selected from the group of leathers, fibers, natural and/or synthetic fabrics. Furthermore, the

support base 7 may not only extend at the rear portion 3 but also under the transpiring layer, therefore at the front portion 2.

- 5 As shown in the annexed FIG. 3 and FIG. 4, the front portion 2 may comprise an insert 10 of gel material, placed at the metatarsal region, to also absorb shocks between the foot and the ground in this area.
- 10 The above insole 1 is fabricated according with a method as described below. Particularly, the method comprises the steps of forming a front portion 2 designed to interact with the foot at the metatarsal region and at least partly at the plantar arch, and
- 15 forming a rear portion 3, integral with the front portion 2, and designed to interact with the heel. In more detail, the method comprises the step of forming a gel layer 4, by molding it in a special mold (not shown), substantially over the whole plan size of the
- 20 rear portion 3.

The gel layer 4 may be molded in various manners. According to a first embodiment, the gel layer 4 is co-molded with the front portion 2. Thus, the previously preformed front portion 2 is placed in the mold, and the gel material is introduced thereafter. Therefore, the gel layer 4 forms the whole rear portion 3 and such molding process allows to connect the front portion 2 to the rear portion 2 by a continuous junction 6.

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In a second embodiment, the gel layer 4 is co-molded with the front portion and a support base 7 made of a semi-rigid material. Here, the gel material is molded

over the support base 7 at the rear portion 3 and permanently bonds both with the support base 7 and the front portion 2.

- 5 In a third embodiment, the front portion 2 and the rear portion 3 are fabricated separately and are later joined by a substantially continuous connecting junction. Here, the rear portion 3 may be either only formed by the gel layer 4 or also comprise the support  
10 base 7. Further, the front portion 2 may be joined to the rear portion by gluing, stitching or other similar methods.

Once the intermediate assembly composed of the front  
15 portion 2 and the rear portion 3 has been fabricated according to one of the above embodiments, the gel layer 4 may be varnished at one upper surface 5 to reduce tackiness to the heel.

- 20 Alternatively, before fabricating the rear portion 3 in accordance with any of the above embodiments, the mold may be previously coated with a non-stick varnish, designed to cover an upper surface 5 of the gel layer 4 to reduce its tackiness to the heel.

25 From the above disclosure, the insole of the invention proves to fulfill the proposed objects and particularly provides a high comfort level, by effectively absorbing shocks caused by foot/ground contact.

- 30 The insole of the invention is susceptible of a number of changes and variants, within the inventive concept disclosed in the appended claims. All the details

thereof may be replaced by other technically equivalent parts, and the materials may vary depending on different needs, without departure from the scope of the invention.

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While the insole has been described with particular reference to the accompanying figures, the numerals referred to in the disclosure and claims are only used for the sake of a better intelligibility of the 10 invention and shall not be intended to limit the claimed scope in any manner.